to measuring the flow of a river by putting the float in an eddy near the shore, while the 8,000-meter level is safely below the upper inversion. It is in this region of comparatively uniform changes that seasonal effects are most clearly seen.

TABLE 1.—*Observed vertical temperature gradients between 3,000 and 8,000 meters elevation.*

Date.	Elevation.	Temperature.	$\frac{\Delta t}{100 m.}$	Date.	Elevation.	Temperature.	$\frac{\Delta t}{100 m.}$
			LINDENBERG.				
	Meters.	°C.			*Meters.*	°C.	
Aug. 3, 1905...	3,514 7,652	− 7.0 −40.0	0.798	July 5, 1906...	3,000 8,000	1.3 −34.9	0.724
Aug. 29, 1905...	3,000 8,000	− 2.4 −44.5	0.842	Aug. 2, 1906...	3,070 7,810	2.0 −36.7	0.817
Aug. 31, 1905...	3,000 8,000	− 1.0 −27.2	0.524	Sept. 6, 1906...	2,870 8,390	3.2 −28.4	0.572
Jan. 4, 1906...	3,000 8,000	− 4.8 −41.7	0.738	Feb. 7, 1907 ..	3,000 8,000	−14.2 −58.2	0.880
Feb. 1, 1906...	3,000 8,000	− 9.6 −42.4	0.656	July 4, 1907...	3,000 8,000	1.4 −26.6	0.560
July 4, 1906...	3,022 7,782	0.3 −35.3	0.746				
			PAVLOVSK.				
Feb. 9, 1905...	2,280 8,000	−17.8 −50.0	0.642	Feb. 1, 1906...	3,000 5,960	−22.1 −32.7	(0.358)
July 6, 1905...	3,000 8,000	0.9 −30.9	0.636	July. 5, 1906...	3,000 5,820	2.3 −11.7	(0.497)
Aug. 29, 1905...	3,000 8,000	− 4.4 −35.7	0.626	Sept. 6, 1906 ..	3,060 8,000	− 3.6 −36.3	0.662
Aug. 30, 1905..	3,000 8,000	− 4.0 −32.8	0.576	Jan. 14, 1907...	3,000 7,800	−21.0 −47.8	0.670
Jan. 4, 1906...	2,970 8,000	− 8.3 −41.6	0.662	Feb. 7, 1907...	3,000 8,000	−12.6 −49.5	0.738
Mar. 1, 1906...	3,000 8,000	−16.7 −52.5	0.716	Mar. 7, 1907...	3,000 8,020	−15.5 −44.3	0.575
			STRASSBURG.				
	Meters.	° C.			*Meters.*	° C.	
Jan. 5, 1905. .	3,000 8,000	− 4.2 −41.4	0.744	Mar. 1, 1906. .	3,000 7,000	−12.4 −35.6	0.655
Mar. 2, 1905...	3,000 8,000	−14.0 −51.3	0.746	July 4, 1906. .	3,000 7,000	2.2 −24.5	0.668
July 6, 1905...	3,000 8,000	0.1 −31.7	0.636	July 5, 1906. .	3,000 8,000	2.6 −29.6	0.642
Aug. 3, 1905...	3,000 8,000	8.2 −19.1	0.546	July 6, 1906. .	3,000 3.000	− 1.9 −30.7	0.576
Aug. 29, 1905...	3,000 8,000	− 4.7 −37.7	0.660	Aug. 2, 1906. .	3,000 8,000	8.0 −25.3	0.666
Aug. 30, 1905...	3,000 8,000	− 4.3 −36.4	0.642	Sept. 6, 1906. .	3,000 8,000	3.7 −27.9	0.603
Aug. 31, 1905...	3,000 8,000	− 2.8 −33.7	0.618	Jan. 4, 1907. .	3,000 8,000	− 5.1 −38.4	0.666
Jan. 4, 1906...	3,000 8,000	− 8.5 −43.3	0.696	Feb. 7, 1907. .	3,000 8,000	−11.4 −51.4	0.800
Feb. 1, 1906...	3,000 8,000	− 8.4 −41.2	0.656	Mar. 7, 1907 .	3,000 8,000	−13.4 −47.2	0.676
			TRAPPES.				
Jan. 5, 1905...	3,000 8,000	− 7.8 −45.6	0.756	Mar. 1, 1906. .	3,000 7,000	− 8.3 −42.4	0.852
Mar. 2, 1905...	3,000 7,000	−17.0 −51.0	0.850	July 4. 1906. .	3,000 8,000	− 0.2 −31.7	0.603
July 6, 1905...	3,000 8,000	0.6 −27.6	0.564	July 5, 1906. .	3,000 8,000	3.2 −27.8	0.602
Aug. 3, 1905...	3,000 7,800	3.7 −23.7	0.573	Aug. 2, 1906. .	3,000 8,000	11.7 −19.9	0.603
Aug. 29, 1905...	3,000 8,000	− 5.6 −42.4	0.736	Sept. 6, 1906. .	3,000 8,000	0.4 −28.5	0.578
Aug. 30, 1905...	3,000 8,000	− 1.1 −41.6	0.810	Jan. 4, 1907. .	3,000 8,000	− 3.2 −41.8	0.772
Aug. 31, 1905...	3,000 7,540	− 4.4 −37.8	0.736	Feb. 7, 1007. .	3,000 8,000	−14.6 −57.9	0.866
Jan. 4, 1906...	3,000 7,850	− 5.7 −41.4	0.736	July 4, 1907	3,000 8,000	− 5.5 −34.0	0.570
Feb. 1, 1906...	3,090 8,000	− 4.1 −33.8	0.594				
			UCCLE.				
July 5, 1906...	3,490 8,460	− 4.0 −43.5	.795	Sept. 5, 1907. .	3,492 9,050	0.8 −31.9	.588
Aug. 2, 1906...	2,900 8,240	10.1 −26.4	.683	Jan. 3, 1908. .	2,627 8,375	− 9.7 −51.1	.720
Jan. 14, 1907...	2,990 8,550	− 4.5 −40.5	.647	Feb. 6, 1908. .	3,000 8,000	− 4.0 −38.9	.698
Feb. 7, 1907...	2,970 7,740	−11.4 −46.3	.732	Mar. 5, 1908. .	3,000 7,000	−19.0 −55.7	.917
Mar. 7, 1907...	2,960 8,330	− 7.2 −47.8	.756	July 29, 1908. .	3,000 7,700	3.0 −25.2	.600
July 24, 1997 ..	3,428 8,854	2.2 −33.3	.654	July 30, 1908. .	3,000 8,000	2.3 −29.0	.626
July 25, 1907...	3,598 8,856	3.2 −31.7	.664	Sept. 3, 1908. .	3,000 8,000	−10.6 −42.1	.630

TABLE 2.—*Average vertical temperature gradients between 3,000 and 8,000 meters elevation,* $\frac{\Delta t}{100 m.}$

Place.	Summer.	Winter.
Lindenberg	0.699	0.758
Pavlovsk	0.599 (0.625)	0.623 (0.667)
Strassburg	0.626	0.705
Trappes	0.637	0.775
Uccle	0.655	0.745
Average	0.643 (0.648)	0.721 (0.730)

The observations obtained at Uccle are copied from Ciel et Terre, the others from Veröffentlichungen der International Commission für Wissenschaftliche Luftschiffahrt.

The average gradients, exprest in change of temperature in degrees centigrade per hundred meters change in elevation, are given in Table 2. The seventy-two observations upon which they are based are not nearly enough to secure averages free from storm and other irregularities, but probably are sufficient to demonstrate the kind of change in the gradient caused by change of season. As shown by Table 2 the gradient at each of these stations was greater in winter than during the summer, the general average being about 10 to 9.

Two of the gradients found at Pavlovsk were exceptionally low, probably due to unusual local conditions. The numbers inclosed in parentheses give the averages with these exceptional gradients ruled out. The others with them included.

THE FORMATION OF HAIL.

By Dr. J. B. GIBSON. Dated Salisbury, N. C., January 5, 1909.

In the MONTHLY WEATHER REVIEW for January, 1906, 34:30, the Editor has published some observations by Doctor Gibson on the formation of hail, and the following extract from a recent letter presents a slight modification of his earlier views:

It is well known that, as a rule, hail precedes the rain. The general opinion that hailstones have a nucleus of snow I do not believe to be justified. * * * Consider a tumbler of water with all but its central portion turned into crystal ice. This is the natural process in the open air. Before solidification is entirely completed hold the central portion of the glass up at the level of the eye and shake it. A globular mass of unfrozen water and mush ice will be found in the dark central portion. Now let freezing completely solidify the contents of the glass and this central part will be a mass of snow-white striæ radiating in every direction. These streaks are as white as cotton thread. This central white core is what is seen in the hailstone, and is produced by the natural process of freezing the central portion last. I venture to assert that snow will not form at all under conditions such that sleet and hail will be generated readily and abundantly.

THE IMPORTANCE OF SYSTEMATIC OBSERVATION OF PERSISTENT METEOR TRAINS.

By C. C. TROWBRIDGE, D. Sc., Columbia University. Dated September, 1908.

[Reprinted from The Observatory, No. 402, November, 1908.]

The nature of the luminous cloud occasionally seen in the track of large meteors, known as the presistent streak or train, has long been regarded as a mystery by astronomers. Meteors which leave these long-enduring trains are few in comparison to the total number of meteors that are observed, and consequently even experienced observers are sometimes taken unprepared, and fail to record an observation with desired detail. Many trains have been seen, however, which have remained visible from ten to thirty minutes, and definite and authentic facts concerning them have been recorded in numerous cases. The late Prof. H. A. Newton, of Yale University, and Prof. E. E. Barnard, of the Yerkes Observatory, have both published some valuable observations on the drift of trains in the United States, and the late Prof. A. S. Herschel, Mr. W. F. Denning, Mr. T. W. Backhouse, and others have likewise published many important facts relating to presistent trains seen in England. Indeed, a very large part of the progress of meteoric astronomy